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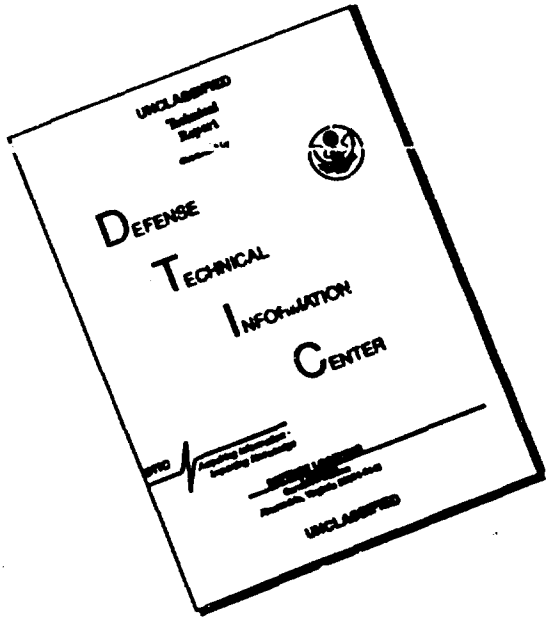

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ON THE EFFECTS OF SOME FUNGICIDES UPON THE INFECTION AND THE DEVELOPMENT OF LESIONS OF THE BACTERIAL LEAF BLIGHT OF THE RICE PLANT

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211

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Introduction

Fungicides for use against the bacterial leaf blight of the rice plant are still in the experimental stage of development, and it is important that the effectiveness of these chemicals be tested under as near real conditions as possible. From this standpoint, the authors conducted this series of tests to evaluate the degree of effectiveness of various fungicides with respect to inhibition of infection and the growth of lesions of this disease, also to determine the loss in effectiveness of fungicide application with time lapsed after infection, the latter being predicated on the hypothesis that maximum effect was achieved with application immediately following a rainstorm.( )

Samples and Method of Experiment

The variety of wetland rice used was Kanzan, with two shoots bunched together planted initially in a 1/20,000 size Wagner pot, then on July 21, two bunches being planted in a single pot.

Fertilization consisted of 3 grams of ammonium sulfate, 0.4 grams of potassium sulfate, and in order to improve the susceptibility of the plant, 2 grams of ammonium sulfate was furnished seven days prior to inoculation with the disease.

Fungicides used were cerosan lime and 8-24-100 Bordeaux mixture.

The bacteria used was obtained from a culture maintained by the Plant Pathology Laboratory of the Faculty of Agriculture of the Kyushu University. The culture medium used was one recommended by the above laboratory, consisting of 300 grams of potato broth, 1 gram of $NaNO_3$, NaH_2PO_4 2 grams, NaCl 2 grams, peptone 5 grams, sugar 15 grams, agar agar 20 grams, and distilled water 1,000 cc.

The plants were infected by means of a multiple-needle inoculation technique using ten needles, the terminal, second, and third leaves of each plant being inoculated in one spot in the middle of the leaf. The infecting agent was obtained by growing a slant culture for two weeks, then diluting the product to the required strength with sterile distilled water. The inoculation was performed immediately after the plant came into ear, that is, on September 22. Following inoculation, the plants were kept in a damp room for five days, after which they were transported outdoors.

The spraying of fungicide was conducted on several different occasions, immediately after inoculation, five hours after, and one, two, and four days following inoculation. Three pots were used in each test lot. The development of the disease was gaged by means of measurement of the length of the lesions from the point of infection, and inhibition of the infection by the fungicide was determined by the figure

$$100 - (\text{number of infections}/\text{Number of samples inoculated}) \times 100$$

Conclusions

(1) Effect of the fungicide in inhibiting development of the infection:

The result of analysis of the dispersion given in Table 1 is shown in Table 2.

Table 1. Result of Measurement of Length of Lesions

第1表 病斑長測定成績

区分	処理	10 無セレタン無ボルドー						10 無セレタン有ボルドー					
		接種	直後	5時後	1日後	2日後	4日後	接種	直後	5時後	1日後	2日後	4日後
第三葉	1	11.7	8.1	8.7	8.3	8.7	9.6	10.1	9.1	7.9	8.3	8.5	9.5
	2	13.7	7.5	7.3	7.9	9.3	11.4	14.1	7.9	7.3	7.9	10.3	10.5
	3	13.3	7.0	7.0	7.7	7.0	9.8	13.4	10.5	10.1	10.5	9.6	10.1
	平均	12.9	7.5	7.3	8.0	8.3	10.3	13.5	9.2	8.4	8.9	9.5	10.0
第二葉	1	11.7	10.8	10.9	11.5	11.1	12.7	14.9	12.7	11.2	9.8	10.6	11.8
	2	17.0	9.8	10.5	9.8	12.1	12.8	16.9	9.1	9.6	11.2	11.8	11.7
	3	14.5	8.5	9.6	11.7	9.6	11.2	16.1	13.2	11.0	13.2	12.5	13.3
	平均	14.4	9.7	10.3	11.0	10.9	12.2	16.0	11.7	10.6	11.4	11.6	12.3
第一葉	1	16.3	10.9	13.3	13.6	13.6	16.0	18.4	15.2	13.9	13.4	14.5	14.9
	2	19.3	11.5	12.3	14.1	15.8	15.7	18.4	13.1	13.2	15.1	14.8	15.1
	3	17.1	10.9	12.0	15.0	13.3	13.1	17.7	14.9	14.4	15.5	15.1	15.7
	平均	17.6	11.1	12.5	14.2	14.2	14.9	18.2	14.4	13.8	14.7	14.8	15.2

備考：数字は夫々病斑42～57個について調定した平均値であり，単位はcmである。

Legend: 1 - Result of measurement of length of lesions; 2 - Leaf distinction; 3 - Terminal leaf; 4 - Second leaf; 5 - Third leaf; 6 - Treatment; 7 - Average; 8 - Ceresan lime; 9 - Bordeaux solution; 10 - Control sample; 11 - Immediately after inoculation; 12 - Five hours after inoculation; 13 - One day after; 14 - Two days after; 15 - Four days after; 16 - Remarks: The values in units of centimeters are the averages of measurements made of some 42 to 57 lesions.

Table 2. Dispersion of values of measured lengths of lesions.

第2表 病斑長調定分散分析表

要因	自由度	偏差平方和	平均平方和	F	要因	自由度	偏差平方和	平均平方和	F
T	1	22.0	22.0	16.9**	C×H	10	6.4	0.6	—
C	5	289.7	57.9	44.5**	T×C×H	10	4.1	0.4	—
H	2	473.1	236.6	182.0**	E	72	94.6	1.3	—
H×C	5	34.9	7.0	5.4**	T0	107	925.6	—	—
T×H	2	0.4	0.2	—					

備考 T：薬剤の種類，C：薬剤散布時期，H：葉位，E：誤差，T0：全体

Legend: 1 - Dispersion of values of measured lengths of lesions; 2 - Element; 3 - Degree of freedom; 4 - Sum of squares of deviations; 5 - Mean square sums; 6 - Remarks: T: Type of fungicide, C: Time of fungicide application; H: Order of leaf, E: Error, T0: Total

disease.(2) Effect of fungicide in inhibiting development of the

The rate of inhibition of disease development of the fungicides tested are shown in Table 3.

Table 3. Rate of inhibition of disease development.

第3表　発病阻止率　1

区分	処理	セレサン石灰						ボルドウ液					
		接種	直後	5時間後	1日後	2日後	4日後	接種	直後	5時間後	1日後	2日後	4日後
止葉	1	0	26.7	20.8	9.1	11.9	3.6	0	3.8	15.5	6.8	10.0	0
	2	0	27.7	19.5	21.6	5.8	10.7	0	17.0	24.5	8.7	0	3.4
	3	0	35.8	22.4	14.3	18.7	28.0	0	5.4	6.5	3.7	3.8	4.6
	平均	0	30.1	20.9	15.0	12.1	14.1	0	8.7	15.5	6.4	4.6	2.7
第二葉	1	0	3.7	0	0	4.5	0	0	0	0	6.7	0	0
	2	0	9.4	0	4.8	0	7.1	0	4.3	9.4	4.5	0	0
	3	0	7.1	3.7	0	7.7	5.3	0	0	0	0	2.9	0
	平均	0	6.7	1.2	1.6	4.1	4.1	0	1.4	3.1	3.7	1.0	0
第三葉	1	0	4.3	0	0	0	0	0	0	0	0	0	0
	2	0	4.3	0	0	0	0	0	0	4.5	0	0	0
	3	0	4.3	10.5	0	0	0	0	0	0	0	0	0
	平均	0	4.3	3.5	0	0	0	0	0	1.5	0	0	0

Legend: /Line items and column headings are the same as those for Table 1; consult the latter for details./

In Table 4 is shown the result of dispersion analysis after variable transformation of the data in Table 3 making use of Bliss's tables.

Table 4. Analysis of dispersion of rate of inhibition of disease development.

第4表　発病阻止率分散分析表

1	2	3	4	
要因	自由度	偏差平方和	平均平方和	F
T	1	620.7	620.7	20.4 **
C	5	1,979.6	395.9	13.0 **
H	2	4,024.1	2,012.1	66.0 **
H×C	5	571.2	114.2	3.74**
T×H	2	216.5	108.3	3.55 *
C×H	10	1,099.5	110.0	3.61**
T×C×H	10	192.0	19.2	—
E	72	2,196.3	30.5	—
T0	107	10,899.9	—	—

5 備考：T, C, H, E, T0 は第2表に同じ

Legend: 1 - Factor; 2 - Degree of freedom; 3 - Sum of squares of deviation; 4 - Mean square sum; 5 - Remarks: Definition of T, C, E, E, and T^0 is the same as for Table 2.

Discussion and Conclusions.

According to the results of measurement of lesions in the present test, it was found that [illegible], a wettable powder preparation, was more effective than the copper preparation, lime Bordeaux solution, in inhibiting the development of the disease lesions, and also that the effect of fungicide application was pronounced when occurring immediately after and also five hours following inoculation with the bacteria, but that the effectiveness gradually declined with later application. These results indicate that fungicide application, in order to be most effective, must take place as soon as possible following the possibility of infection. On the other hand however, the results also indicate that application four days after infection is better than no application.

With respect to the effectiveness of the fungicides in preventing attack by the pathogen, ceresan lime was found to be more effective than the Bordeaux lime solution, similar to the effectiveness of the former over the latter with respect to inhibition of development of the disease. As a preventive measure, both fungicides were also found to be most effective when applied immediately after or five hours after inoculation, with this effectiveness declining with time lapsed after inoculation. The effectiveness of the fungicides as preventives is, however, limited to the terminal leaf, with little effectiveness of this sort observable with the second and other following leaves.

From the standpoint of eradication or control of the bacterial leaf blight of rice, the effectiveness of the fungicides tested with respect to prevention of infection or inhibition of development of the disease leaves much to be desired. One interesting result of the test worth noting is the fact that the effectiveness of the fungicides with respect to disease prevention or inhibition of development of the disease is most pronounced in the case of the terminal leaf, and it seems that this line of inquiry could be pursued further despite the general explanation that this could be due to the higher resistance of the upper over the lower leaves to bacterial blight infection (2)(3).

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